Ohmega Ω Resistivity Meter

USER'S MANUAL

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WARRANTY

1. Allied Associates Geophysical Ltd (AAGL) products are fully tested in our workshop both during construction and after completion and are dispatched in full working condition. Instruments are guaranteed for 12 months from the date of dispatch from the factory, liability being limited in accordance with clause 9 of the General Conditions for the Supply of Plant and Machinery for Export (UN Economic Commission for Europe, Geneva, 1953).

2. When unpacking, please check the contents against the packing list and inspect for damage and malfunction of any kind. In the case of any defect, inform the carrier immediately and report in full to AAGL or their local agent the extent of the damage. Await their reply before taking any further action, except in exceptional circumstances.

3. Should a fault be identified that cannot be remedied on site within the guaranteed period, consult with AAGL. Normal procedure will be to return the unit (or complete system if necessary), carriage paid, to AAGL for inspection and repair or replacement free of charge, provided the fault has not been due to misuse.

4. As far as possible use original case and packaging material for return of the instrument. Equipment is on occasions subject to very rough handling during transit and AAGL cannot be liable for damage due to faulty packing.

5. It is the responsibility of the customer to notify AAGL or their agent of defect or damage to the equipment within a reasonable time of receipt. We would recommend that any defect or omission should be notified verbally but with written confirmation no more than 72 hours after receipt of the product.

6. AAGL Associates Geophysical Ltd will take all necessary steps to rectify any failure, which is deemed the responsibility of the manufacturer, as quickly as possible.

7. No liability against consequential loss can be accepted under any conditions.

Thank you for purchasing the Allied Ohmega Ω Resistivity Meter.

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CONTENTS

	WARRANTY	2
	CONTENTS	4
1.	GENERAL DESCRIPTION OF THE OHMEGA Ω RESISTIVITY SYSTEM	5
1.1	The Ohmega Ω	5
1.2	Power Booster	5
2.	THE ALLIED OHMEGA Ω	6
2.1	Construction	6
2.2	The Controls and Connections	6
2.2.1	ON – OFF Switch	7
2.2.2	GO button	7
2.2.3	mA (current) button	7
2.2.4	MODE button	7
2.2.5	Number of Cycles	8
2.2.6	Sample Time	8
2.2.7	Alpha-Numeric Display	8
2.2.8	External Power Supply	9
2.2.9	Manual Control	9
2.2.10	External System Connection	9
2.3	Making Measurements	9
2.4	The Signal	11
2.5	Power Supply	12
2.6	Battery Charger	13
2.7	Instrument Parameters	13
3.	OHMEGA SPECIFICATIONS	14
4.	EC CERTIFICATES OF CONFORMITY	15
5.	USER MANUAL COMMENT SHEET	17

1. GENERAL DESCRIPTION OF THE SYSTEM

1.1. THE OHMEGA Ω

The OHMEGA Ω is a high quality earth resistance meter capable of accurate measurement over a wide range of conditions.

It has a maximum power output of 18 watts, manual selection of current in steps up to 200 mA, a choice of sample time / signal length averaged and three frequency settings. The receiver incorporates automatic gain steps, which provide a range of measurements from 0.001Ω to 360kΩ

The instrument is powered by a large capacity rechargeable battery providing several days of use without recharging in average terrain conditions. The OHMEGA Ω is housed in an impact-resistant steel case.

1.2. POWER BOOSTER

Starting in AUGUST 2000 the power booster is fitted as standard to all Ohmega Ω systems providing current capacity to 200mA.

2. THE GEOPULSE OHMEGA Ω

2.1 CONSTRUCTION

The OHMEGA Ω is housed in an impact-resistant Pelican case and is fully water-resistant. The various units are mounted below the front panel and the whole instrument can be removed from the case by unscrewing the plate. The transmitter/ receiver controls and display occupy the full area of the instrument front panel.

The Ohmega Ω is supplied with 4 stainless steel electrodes, four 100m cables on lightweight reels, and a battery charger.

The design of the Ohmega Ω allows for the construction of a basic resistivity meter and incorporation of bower booster, now fitted as standard.

2.2 THE CONTROLS AND CONNECTORS

Fig.2. Two OHMEGA Ω front panel showing Operation Buttons

All the external controls, together with the liquid crystal display are situated on the top front panel of the instrument. They are fully waterproof. The controls are shown in Figure 2 and are described below. In addition to the “ON” switch and the “GO” or initiate measurement button, there are three other buttons marked mA, Mode and Cycles. See Figure 3.

ON – OFF

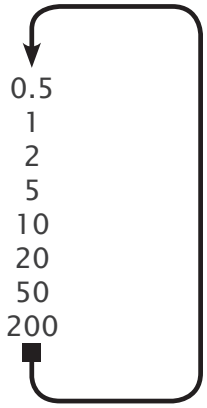
Select to switch the instrument for operation or to switch the instrument off.

GO

Press this button to start measuring with the previously set parameters.

mA (Current)

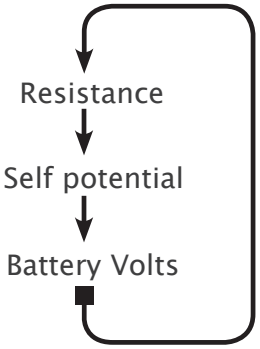
The button marked mA is used to select the desired current in milli-amps. The current is increased each time the button is pressed in the following steps:



The current value selected is indicated on the display.

MODE

The button marked MODE selects the type of measurement. The display will indicate the following sequence of options as appropriate.

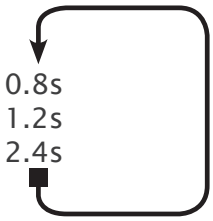


NUMBER OF CYCLES

The button marked Cycles selects the number of readings to be averaged. This can be from 1 to 16. Details of how the signal is processed to obtain a single measurement of ground resistance are given in Section 2.4. of this manual.

SAMPLE TIME

If the MODE and mA buttons are pressed simultaneously the sample time (or signal length) can be changed as shown below:



APLHA-NUMERIC DISPLAY

The 80-character (4x20) liquid crystal display indicates the parameters selected and the measurement details as the survey progresses. See Figure Three. The display can be backlit by pressing Mode and Cycles simultaneously. The light automatically switches off after one minute if no activity is sensed during this time.

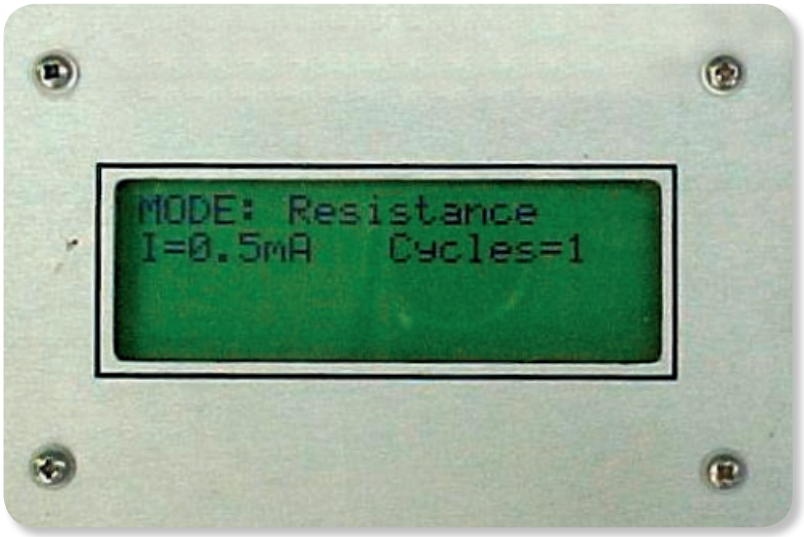


Fig.3. Ohmega Ω Display and Electrode Terminals

EXTERNAL POWER SUPPLY

An external 12V power supply may be connected through the socket Chrg/Ext. See Fig. 5. A connecting lead is supplied for this purpose. It is important to remember the correct polarity when connecting to an external supply.

WARNING! Do not connect to a car battery while it is being charged!

MANUAL CONTROL

The red and black coloured current and potential terminals marked P1, P2, C1, C2, are situated on the front panel – See Figure Three. Single core cables may be connected to these terminals for measuring earth resistance.

2.3 MAKING MEASUREMENTS

1. Check that the instrument is correctly connected to the current and potential cables. See Fig. 7. When the manual Offset Wenner system is used, the current and potential terminals are connected to the Offset Wenner system switchbox.

2. Switch on. Display shows

```
MODE: Resistance
1=0.5mA  Cycles=2
```

3. Check battery volts. If the battery is below the operating voltage the display will read

```
BATTERY LOW
Reduce Current
```

4. If the external temperature is above 40°C or below 0°C , take steps to bring the temperature within the operating range. Check the temperature regularly since in tropical sunshine it may well rise above the danger level. Note that although the instrument will operate below 0°C, it is not designed for work under exceptionally low temperature conditions.

5. Check the SP voltage. Use the MODE switch to put the instrument into the Self Potential mode. Make a few measurements to see how it is varying by pressing the GO switch and noting the results obtained. The amplitude and rate of change of the SP will affect the readings at low resistance values and determine the instrument settings required to optimise accuracy.

6. Select the current setting using the mA button. Normally start at 2mA and keep as low as possible, consistent with obtaining good repetition. If ground conditions are such that the instrument cannot deliver the required current or there is an open circuit it will read

```
CURRENT ERROR
Check Electrodes
```

Decrease the current and/or water the electrodes to improve ground contact. Experience shows that when operating multicore cable systems, accurate measurements are obtained with contact resistances below 2000Ω

7. Select the number of readings to be averaged using the Cycles button. This will depend to a great extent on ground noise. Start with 4 readings and increase or decrease depending on the consistency of the readings obtained.

8. Select Resistance and press the GO button. The display will initially indicate the voltage gain being used in the measurement.

```
…Setting Gain
G=5   I=2mA   n-3
```

G=5 indicates the amplifier gain setting. These are x5, x0.5, x0.05 and x0.005. In a noisy environment, high and varying SP values may cause the amplifier to saturate during the averaging. The display will show

```
GAIN ERROR
Change Current
```

In this case, reduce the current to bring the signal within the operating range.

The display will then indicate the successive averages of the resistance, bleeping each time during the process. At the standard setting the instrument takes 2.1s to complete a set of 4 readings. A three-figure resistance will show with the decimal point approximately placed, followed by Ω or mΩ. If the potential and current connections have been incorrectly connected a negative sign will precede the digits. This can also be due to ground conditions.

9. If the switching circuits operated by the current or mode buttons on the top panel are faulty the display will read MODE ERROR.

2.4 THE SIGNAL

The transmitter uses commutated DC to produce the signal shown in Fig. 4 (a).

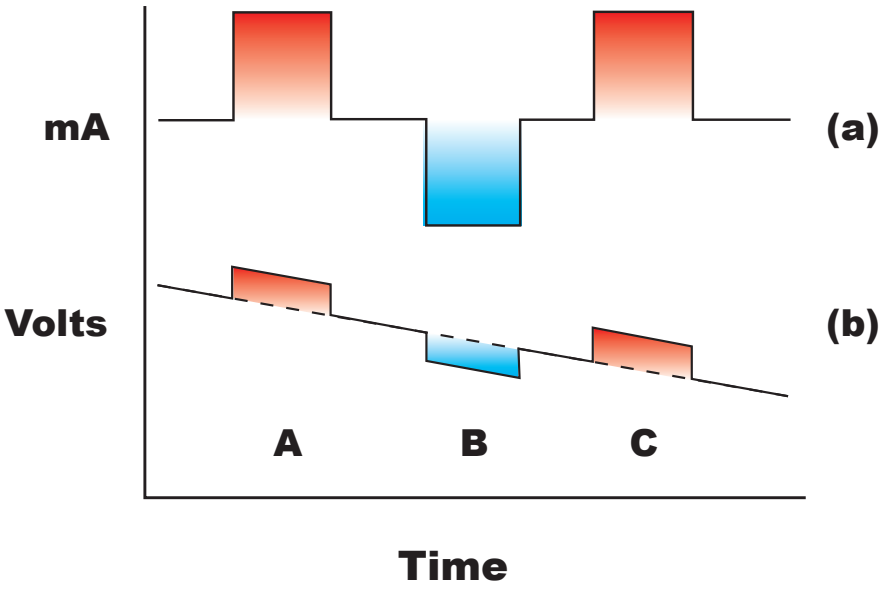


Fig. 4. The OHMEGA Ω SIGNAL (a) Transmitted signal (variable Periodicity), (b) Received signal. Here the attenuated and modified signal is superimposed on slowly varying earth currents. It is sampled over times A, B and C.

The on period is sampled for only the last 4/5 of the on time e.g. 0.8s in 1.0s.

An example of the received signal in the presence of electrical ground noise is shown in Figure 3b. This figure also illustrates the processing technique used to extract a value of the required potential difference from the received signal, here shown superimposed on a slowly varying earth current. The signal is digitally sampled over times A, B and C and the amplitude calculated as (Va+Vc-2Vb)/4). The on/off ratio is 2.5:1 and the sample/unsampled ratio during any "ON" period is 4:1. This is to allow any coupling and IP affects to die away before sampling takes place.

When a number of cycles are averaged the microprocessor calculates the potential difference from successive sets of three "ON" periods, ABC, BCD, CDE, giving values (Va+Vc-2Vb)/4, (Vb+Vd-2Vc)/4, etc.

When conditions are adverse, e.g. a low signal/ground noise ratio, apparent as a lack of consistency in the readings, use higher current settings that do not cause a "GAIN ERROR" and average over 16 cycles. Gain errors are usually due to sudden increases in ground noise saturating the system. If the area is generally very noisy it may be necessary to operate at the longest cycling time. In extreme conditions, i.e. measuring very low resistances against a background of large amplitude and varying SP, highly inconsistent readings may be obtained. In this case it is necessary to put the instrument into the computer command mode and vary the sampling parameters until satisfactory results are obtained. See Section 3.

2.5 POWER SUPPLY

The Ohmega Ω uses sealed gel-cell batteries (7 AH at 12V). Under average working conditions (e.g. 10 offset soundings per day at 5mA) recharging every 2 working days would be safe practice. Electrical imaging uses more drain on the batteries and so the instrument should be charged overnight during survey operations.

Should it be necessary to be away from a mains power source for more than a few days the instrument can be operated using an external supply. A 12V car battery which can be recharged from a vehicle can be used in an emergency. A separate lead is supplied which can be clipped is onto the battery. Be sure to check the polarity before connecting to the instrument.

WARNING! Do not run the vehicle engine while the instrument is connected to the battery as transients from the alternator can damage the transmitter circuitry.

2.6 BATTERY CHARGER

This operates from 240V or 115VAC. The maximum current output is such that batteries can be left on indefinitely without suffering any damage. Charging time from full discharge is 16 hours. If storing the Ohmega Ω for a long period of time, recharge the battery every month. Failure to do so will result in irreversible damage to the battery

NOTE: if the meter is operated while the battery is being charged, the charger is automatically disconnected.

2.7 INSTRUMENT PARAMETERS

The suggested values below have been selected to produce measurements with the minimum of power. The operator can increase the speed of the survey by reducing the current on time to 1 second or less. If this is done it is likely that the current will have to be increased to 1, 2 or 5 mA, depending on the electrode spacing used. If unstable measurements are obtained, the current should be increased.
In low resistivity conditions the current should be increased further. Check the waveform to make sure that a good voltage signal is being detected.

In noisy conditions either the current on time or the number of cycles should be increased.

3. ALLIED OHMEGA Ω SPECIFICATIONS

TRANSMITTER

Maximum power output:	18W
Current range :	0.5mA to 200 mA
Square wave repetition:	8.4s, 4.2s. 2.8s.
Number of readings averaged:	1 to 16.

RECEIVER

Input voltage range:	0 –180V with auto gain averaging.
Input impedance:	22MΩ
Measurement range:	360KΩ – 0.001Ω
Low pass filter	
Display:	80 character alphanumeric liquid crystal
Power supply:	Rechargeable sealed gel–cell. 7 AH @ 12V

GENERAL

Weight:	6kg
Electrode capacity	2 Current, 2 Potential

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4. CERTIFICATE OF CONFORMITY

Product: Charger for ALLIED OHMEGA Ω earth resistance meter

Serial No. ……

Date of Shipment: …….

EMC 89/336/EEC Generic EN50081/1 Light Industrial Emissions,
EN50082/1 Light Industrial Immunity

Tests Applied

BSEN 55011 Class B Conducted Emissions

BSEN 55011 Class B Radiated Emissions

BSEN 61000-4-4 Fast Burst Transients to Level 2 Light Industrial

BSEN 61000-4-2 Static Discharge to Level 2 Light Industrial

Category 1 PASS

Low Voltage Directive 73/23/EEC: N/A below 50V AC.
Machinery Directive 98/37/EEC: N/A – no moving parts.

We, on behalf of Allied Associates Geophysical Ltd, confirm the Product described above meets the requirement in all respects.

Signed…….. Authorised Signatory……..

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CERTIFICATE OF CONFORMITY

Product: ALLIED OHMEGA Ω earth resistance meter

Serial No. .....

Date of Shipment: .....

EMC 89/336/EEC Generic EN50081/1 Light Industrial Emissions,
EN50082/1 Light Industrial Immunity

Tests Applied

BSEN 55011 Class B Radiated Emissions

BSEN 61000-4-4 Fast Burst Transients to Level 2 Light Industrial

BSEN 61000-4-2 Static Discharge to Level 2 Light Industrial

Category 3 PASS

BSEN 55011 Class B Conducted Emissions: N/A – battery only
Low Voltage Directive 73/23/EEC: N/A below 50V AC.
Machinery Directive 98/37/EEC: N/A – no moving parts.

We, on behalf of Campus International Products Ltd., confirm the Product described above meets the requirement in all respects.

Signed..... Authorised Signatory.....

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Alllied Associates Geophysical Ltd

USER MANUAL COMMENTS SHEET

Please note on a copy of this form any suggestions for improvement or any errors found in this manual. Please return the form to:-

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Manual Title:

Rev Number:

Comments: